Classical conditioning
(Two lectures)

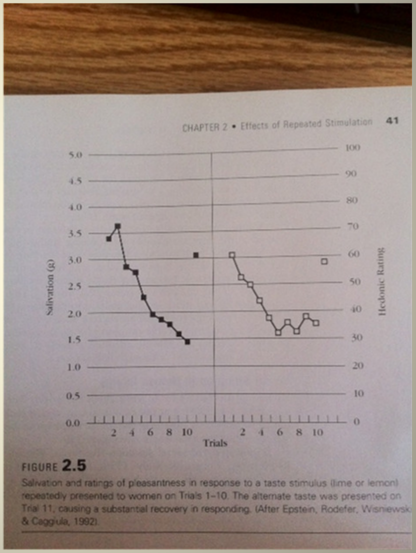
Psychology 248

Prof. Benjamin

Learning through pure repetition

- Habituation
- Sensitization

Habituation



CHAPTER 2 • Effects of Repeated Stimulation 41

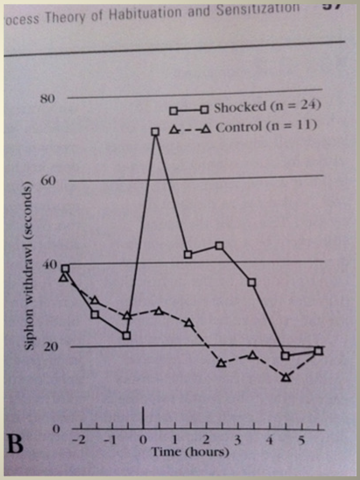
FIGURE **2.5**

Salivation and ratings of pleasantness in response to a taste stimulus (lime or lemon) repeatedly presented to women on Trials 1–10. The alternate taste was presented on Trial 11, causing a substantial recovery in responding. (After Epstein, Rodefer, Wisniewsk & Caggiula, 1992).

Epstein et al. (1992)

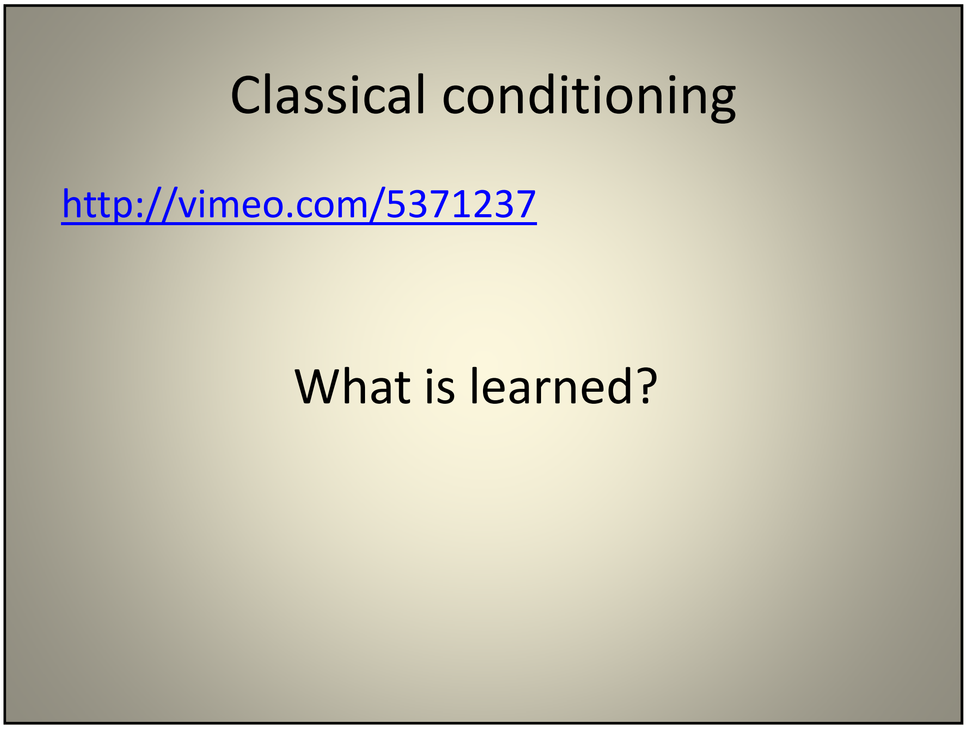
Sensitization

Aplysia (sea slug)



ocess Theory of Habituation and Sensitization

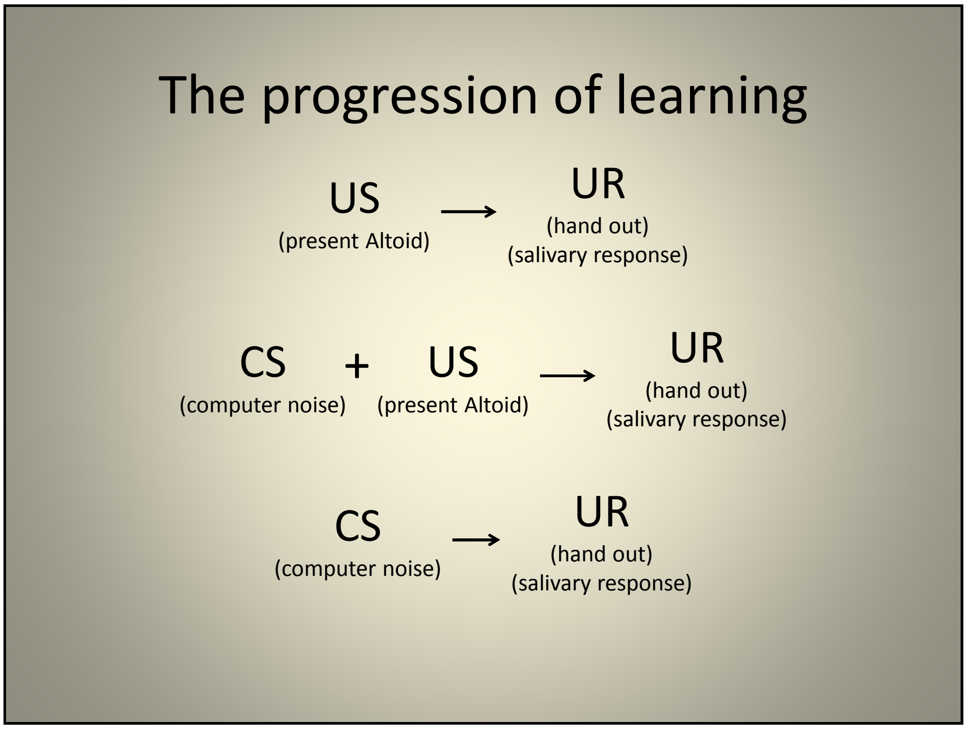
Kandel & Schwartz (1982)



Classical conditioning

http://vimeo.com/5371237

What is learned?



The progression of learning

US (present Altoid) → UR (hand out) (salivary response)

CS (computer noise) + US (present Altoid) → UR (hand out) (salivary response)

CS (computer noise) → UR (hand out) (salivary response)

Eyeblink conditioning in infants

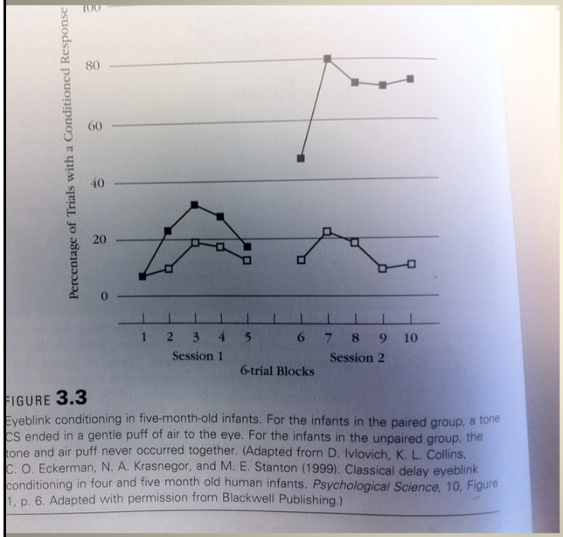


FIGURE **3.3**

Eyeblink conditioning in five-month-old infants. For the infants in the paired group, a tone CS ended in a gentle puff of air to the eye. For the infants in the unpaired group, the tone and air puff never occurred together. (Adapted from D. Ivlovich, K. L. Collins, C. O. Eckerman, N. A. Krasnegor, and M. E. Stanton (1999). Classical delay eyeblink conditioning in four and five month old human infants. *Psychological Science,* 10, Figure 1, p. 6. Adapted with permission from Blackwell Publishing.)

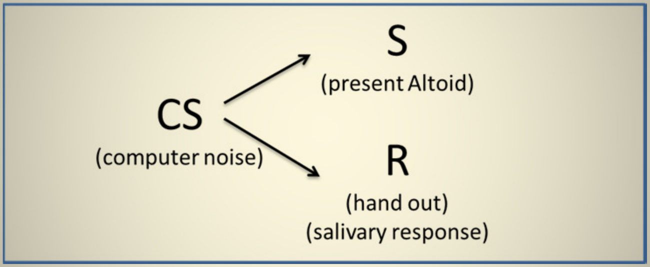
Ivlovich et al. (1999)

US → UR
(puff) (blink)

CS + US → UR
(tone) (puff) (blink)

CS → UR
(tone) (blink)

S-S or S-R association?



CS
(computer noise)

S
(present Altoid)

R
(hand out)
(salivary response)

Evidence for S-S associations

- *Response-prevention*

US → ~~UR~~ *temporary paralysis*
(puff) (blink)

CS + US → ~~UR~~
(tone) (puff) (blink)

CS → ~~UR~~
(tone) (blink)

Later:
CS → UR
(tone) (blink)

Evidence for S-S associations

- *US devaluation*

US → UR
(food) (drool)

CS + US → UR
(tone) (food) (drool)

Test:
CS → UR
(tone) (drool)

hungry dog!

full dog!

Evidence for S-S associations

- *Sensory preconditioning*

CS1 + CS2
(tone) (light)

US → UR
(puff) (blink)

CS1 + US → UR
(tone) (puff) (blink)

CS2 → UR
(light) (blink)

Friday
Martini = gin + vermouth = yum
Saturday
too much gin = yuk.

Does this change our
response to vermouth?

Second-order conditioning

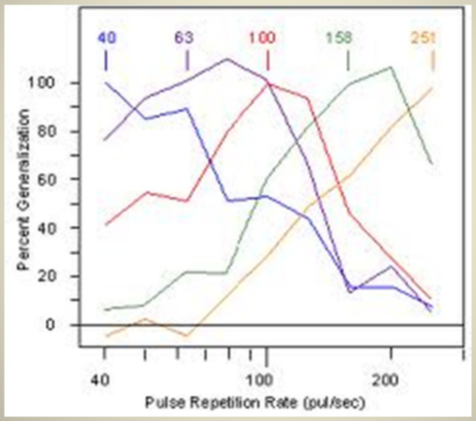
CS1 (light) – US (food) → UR (activity)
CS2 (tone) – CS1 (light)
CS2 (tone) → CR (activity)

CS2 (tone) → CS1 (light) → CR (activity) [S – S]
or
CS2 (tone) → CR (activity) [S – R]

CS1 is devalued: CS1 (light) – no US
But CS2 → CR (activity)

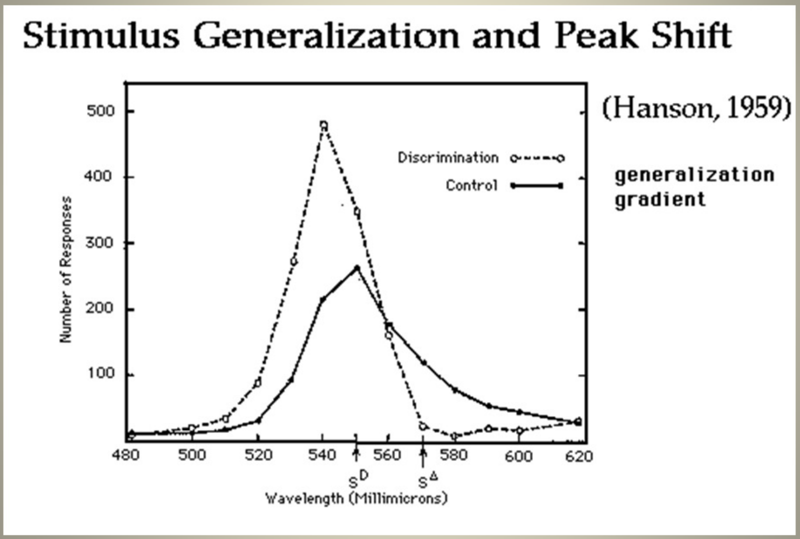
Holland & Rescorla (1975)

Generalization gradients



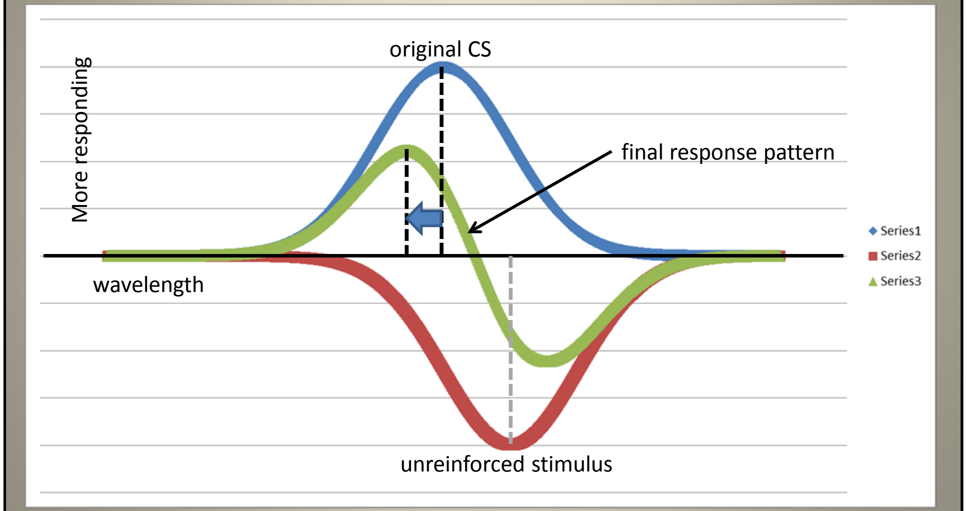
Fay (1994)

Peak shift in generalization



Hanson (1959)

Why peak shift?



What is the CR?

- Is it a *response* to an imagined US?
- Is it an *anticipation* of an upcoming US?

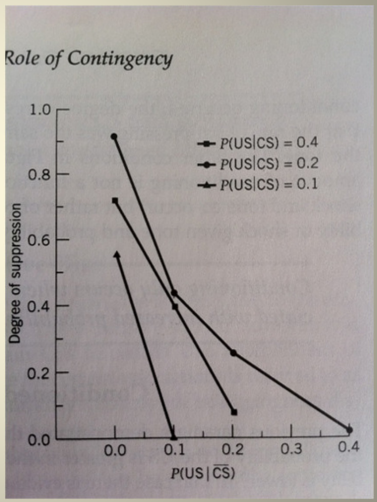
Sometimes the CR is different from the UR:
heart-rate deceleration (CR) vs. acceleration (UR)
CS elicits deceleration (CR)
→ suggests *anticipatory* view is correct

Contingency vs. contiguity (co-occurence)

- Does it matter that US and CS are *close*?
- Does US have to *predict* CS?

  P (Altoid|Noise) >

  P (Altoid|~Noise)



Rescorla (1968)

Taste aversion

- Rats drinking received novel flavor and light AND click
- They then received shock OR nausea induction
- Rats given shock drank less when light AND click are presented.
- Rats given nausea drank less when flavor was present.

CS (light AND click + taste) → US (nausea OR shock)

→Evidence for *associative bias*

→Evidence that contiguity is not critical

  →Nausea can occur 24 hours after taste, and only once!

Garcia & Koelling (1966)

Conditioned inhibition

What if P (US|CS) < P (US|~CS)?

CS+ → US

CS+ and CS- → no US

Summation test: CS2+ → US
less response to CS2+ and CS- than CS2+ alone
Retardation: CS- → US takes longer to train than CS2 → US
Bidirectionality: CS- leads to opposite response than CS+
(e.g., animal avoids food dispenser)

Blocking and overshadowing

[A] CS1 → US

[B] CS1 + CS2 → US

Blocking: CS2 does not elicit response (compared to control group that did not experience [A], even though it has been paired many times with US.

Overshadowing: All animals experience [B], but only CS1 or CS2 acquires ability to elicit response.

Rescorla-Wagner Law

$$\Delta V = \alpha(\lambda - V)$$

λ = current event (1 or 0)
α = rate of learning
V = current association between US and CS

Explains: learning, extinction, blocking, overshadowing, conditioned inhibition

R-W model of learning and extinction

- Excel example of learning and extinction
- How does R-W explain blocking?

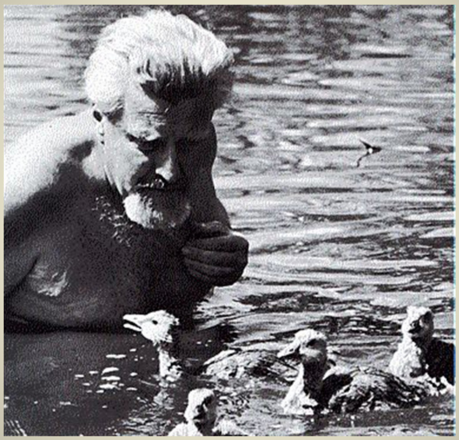
Retroactive unblocking

[A] CS1 → US
[B] CS1 + CS2 → US
{no response to CS2}
[C] CS1 → no US

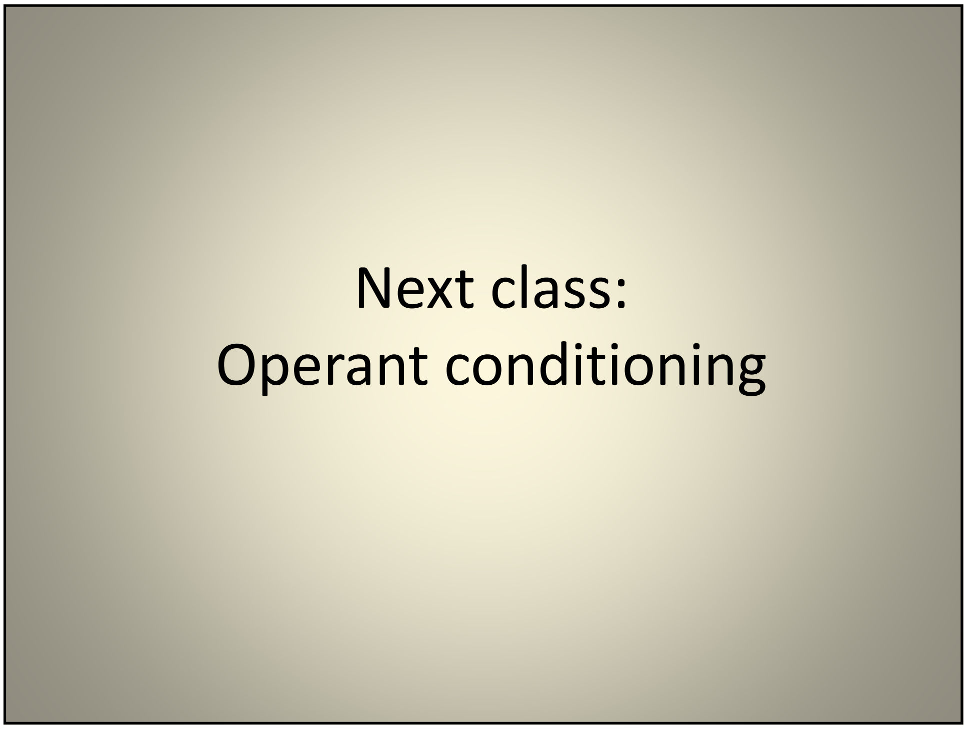
Now there is a response to CS2.

So: something was learned about the CS2 – US relationship.

Imprinting



Konrad Lorenz (and baby goslings)



Next class:
Operant conditioning